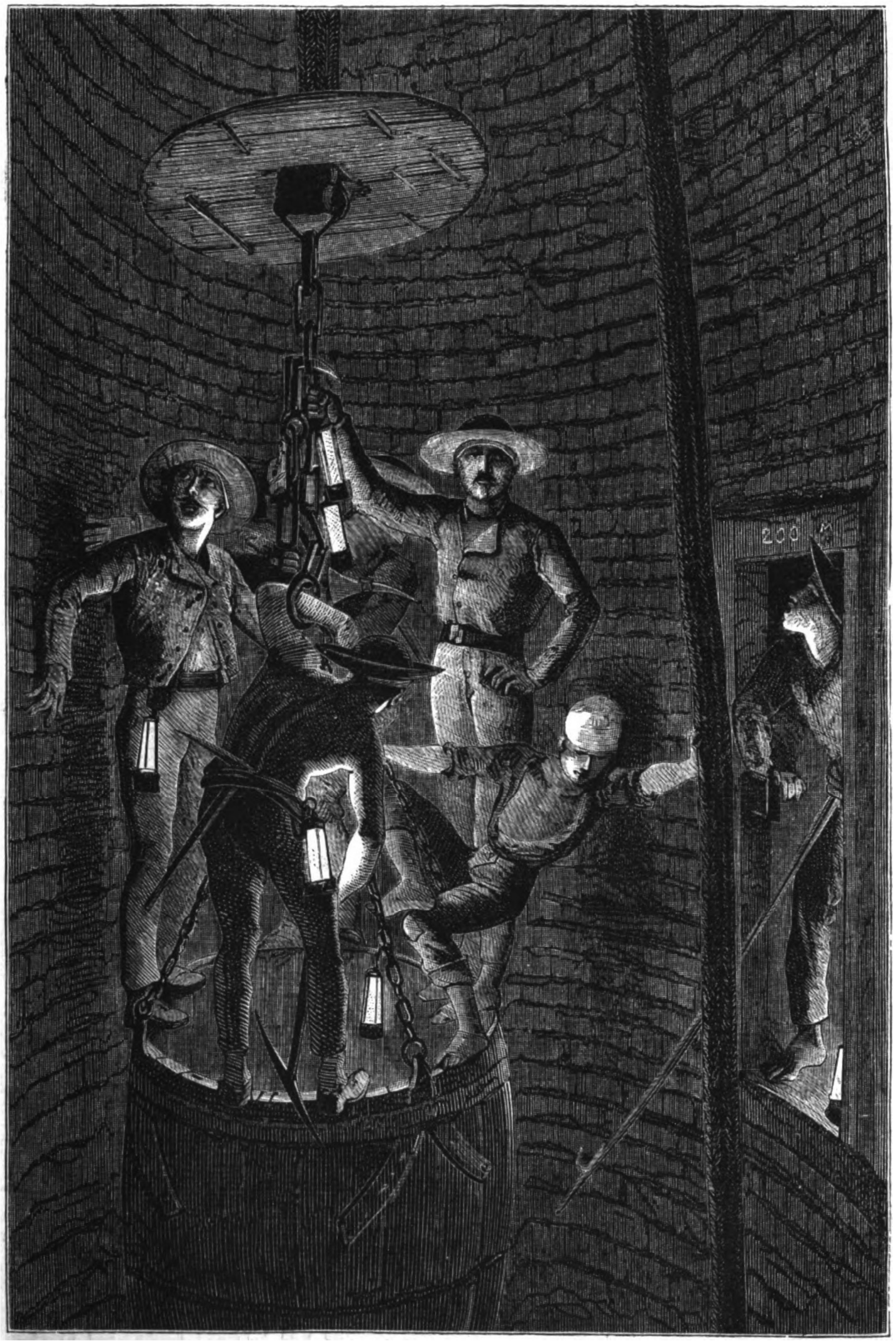
UNDERGROUND LIFE; OR, COAL-MINES AND MINERS.

IT has been very justly asserted that the material prosperity of a country can be ascertained by its richness or poverty in the possession of coal-mines. The chief motive power which does all the physical work, independent of that achieved by the muscles of men and animals, is heat; fuel, therefore, is the most important element in all of the industries which create the wealth of a people. England, France, and the United States, among the nations of the earth, are preëminently powerful; and it is also true that they possess within their respective boundaries larger amounts of coal, in given places, than can elsewhere be found. It is also a remarkable fact that this mineral fuel is most abundantly diffused over the temperate regions of the northern hemisphere, as if the nations who are now the most civilized had naturally settled around beds of coal, that most powerful agent of civilization and progress.



Miners going down a Shaft.

The English people ascribe their great commercial prosperity to their coal-mines; they significantly term them their "Black Indies." An eloquent writer, speaking on the subject, remarks: "On one occasion three hundred vessels, all coal-laden, were seen making deep into the waters, and weighed down with the mineral burden of far more worth to us (England) than auriferous sands or Mexican mines."

What is true of England must be true of the United States; and it is, therefore, with just pride that we read, in a general review of mineral wealth made by M. Simonin (in a recent exhaustive work on mining, published in Paris, and reprinted in London and New York), that "*The coal-fields of the United States are the largest in the world*, extending from the foot of the Alleghany Mountains, on both sides of the chain, but especially on the western side, as far as the Missouri and the Arkansas, reappearing at the base of the Rocky Mountains."

The area of the American coal-formation is asserted to be eight times larger than that of all other known coal-deposits. The coal-fields of the United States have been worked for little more than forty years, but their product already equals the "out-put" of France and Belgium united. The coal-deposits of many of the United States, indeed, cover a fourth, and, in some instances, a third, of their entire area. In these vast and probably exhaustless mines exists the great reserve for future ages. The coal in America mainly lies in fields, or near the surface, while in Europe it is mostly in mines, deep under ground. The following account applies more especially to the mines and miners of France, Belgium, and England.

Like most mineral substances, the history of coal is largely combined with fable. The Greeks and Romans were probably acquainted with the fossil fuel. Aristotle's favorite pupil, Theophrastus, in his treatise on stones, does not omit to speak of coal being found in Liguria and Elis. The ancients, however, made little or no use of this combustible; probably they did not know the proper way to burn it. The forests, in those early times, afforded ample supplies for all the wants of industry, which was then in its infancy. Possibly some miners who smelted and worked the metals, or some blacksmiths who made and tempered arms, might have made occasional use of it as fuel; but this is exceedingly doubtful. In the houses, wood and charcoal were the only fuel; and, as the polished people of those ages inhabited countries favored by Heaven, such as Italy, Greece, Egypt, and Asia Minor, where severe cold is of rare occurrence, they warmed themselves in the sunshine during the winter, even while discussing public affairs in the forum. Perhaps it may also be allowable to suppose that the mean temperature of the air was, in those days, slightly in excess of that of the present day. However this may be, the laws of heat were unknown to the ancients; the presence of vapor was not even suspected, and all mechanical force was solely derived from the muscles of living beings.

When the wind-bags of Æolus were empty, convicts rowed the galleys; when the absence of a stream of water would not allow a bad water-wheel being put up, animals, and even men, turned the mill. We read on the walls of Pompeii, beneath a caricature representing an ass in a mill, this line:

> "Work away, little donkey, as I have worked, and you will profit by it."

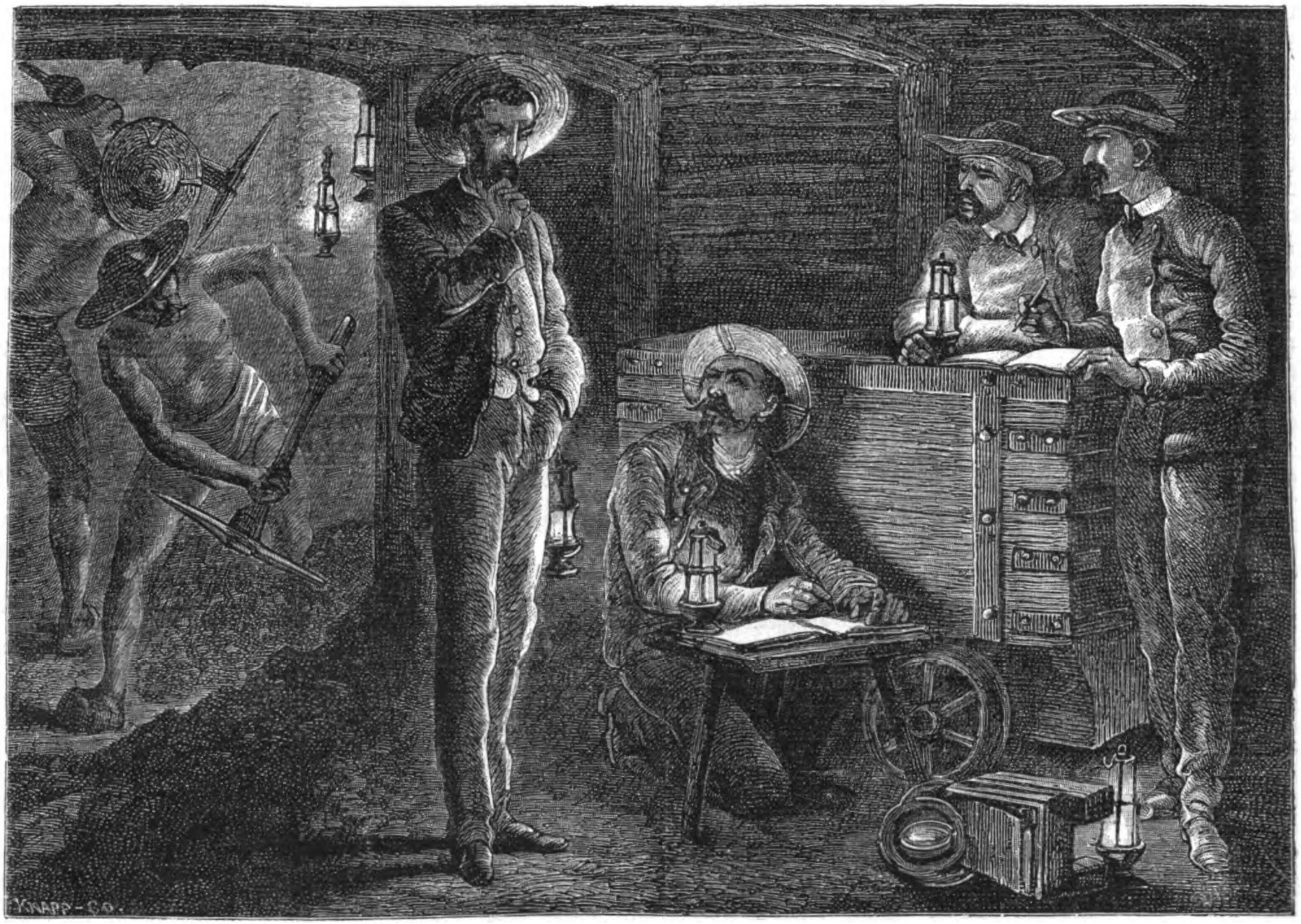
Thus, amongst the ancients, there was little need of coal, either for industrial purposes or in common life. We see with what indifference the masters of the world passed by mineral fuel, when we find that the aqueduct of Fréjus passed through the middle of a coal formation; and that, in the Lyonnaise, the aqueduct that carried water to the beloved capital of Claudius traverses the carboniferous formation; one of the subterranean branches is even cut through the coal, yet nobody troubled his head about this substance. The people and senate of Rome evidently knew nothing of the value of coal.

The Chinese, to whom all great discoveries, except that of America, have been rightly or wrongly accorded by some persons, were acquainted with mineral fuel from a very remote period. They knew how to work it, they even collected the inflammable gases which exude from coal, and used them for purposes of illumination. They have, however, throughout all their history, worked their mines in a very slovenly manner, making no supports for underground ways, no provisions against the inroads of water, or the dangers arising from the explosions of fire-damp and other inflammable gases.

The working of coal-mines on a large scale is really a modern invention, and originated in England. As late as 1306, Edward I. issued a proclamation forbidding the English people to use coal. Toward the close of the thirteenth century, mention is made of the coal-mines of Scotland and Wales. In the seventeenth century the British coal-mines were in full operation, and then gave employment to four thousand ships that carried coal to France, Germany, and Holland. At the close of the reign of King James I. of England (1620), after numerous failures, the manufacture of iron by the use of coal was established; and from this period may be dated that activity in coal-mining which has distinguished modern times. England obtaining the supremacy, Belgium, and then France, followed.

The importance of coal-mines is only measured by the quantities produced, and, from this point of view, coal-mines are affairs of yesterday; it may be said that the date of working them on a large scale marks the date of their origin, and also opens one of the brightest pages recording human progress.

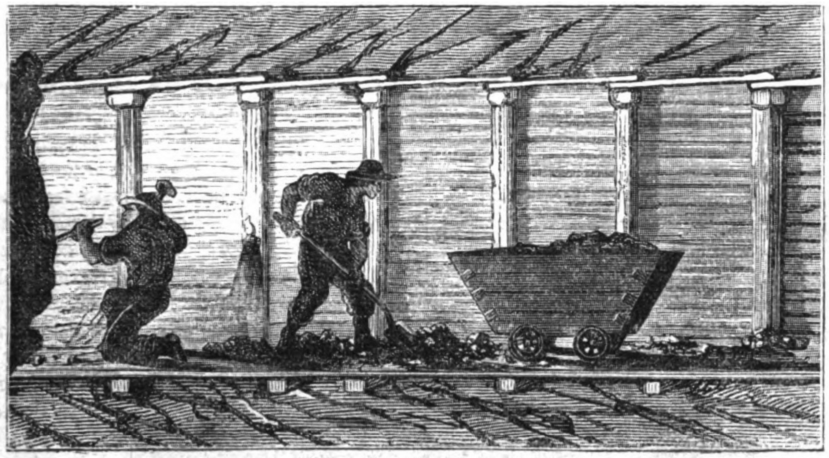
The important fact was not in the discovery of the coal itself, but in its application on a large scale, like that of the present day, to the manufacture of iron and all other metals, and to the heating of steam-boilers, whether fixed, locomotive, river, or engine. It is of no import to the modern to know that the ancients were acquainted with coal, as they did not know how to use it. The true history, therefore, of coal, dates from the eighteenth century, and may be said to be connected with and form part of the history of modern civilization. The steam-engine was invented among the coal-mines; it was needed to pump water from the coal-pits; that necessity met, it was used to raise coal from the mines. Coal is a heavy, bulky article, selling at a low price. It is not enough to tear it from the bowels of the earth; it must be transported economically often to considerable distances. What makes transportation difficult and costly is the state of the roads. To remedy the evils of soft earth sinking under the pressure of heavy bodies, wooden tracks were devised, over which wheels rolled easily; these were applied to underground ways, then extended over the surface—then the wooden rail gave way to iron. Then followed



Geometers and Surveyors of the Mine in Consultation.

discoveries that made coal an efficient agent to raise steam in boilers, and from that time the railway and the locomotive, born of the necessities of working coal, were complete.

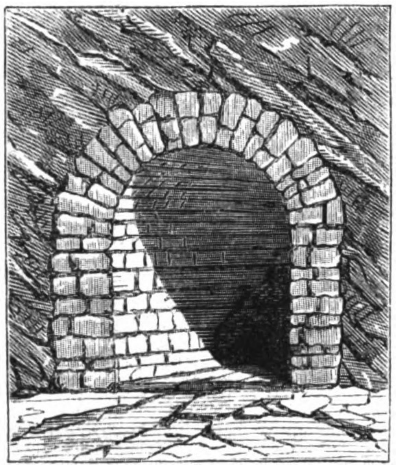
Coal-mines profited the earliest, and to the greatest extent, by these magnificent applications. Already the locomotive carries the indispensable mineral afar, and at so small a cost as to seem almost incredible. This low cost of carriage has everywhere facilitated the distribution of the supply of coal. Ships and railways carry it to countries which do not possess the mineral, and ordinary roads are placed under contribution when the distances are not too great; hence the demand for the fuel has exceeded all bounds. For the last half century the mines have doubled their production in England, France, and Belgium, every fifteen years; in the United States, every four years.



Longitudinal View of a Timbered Level.

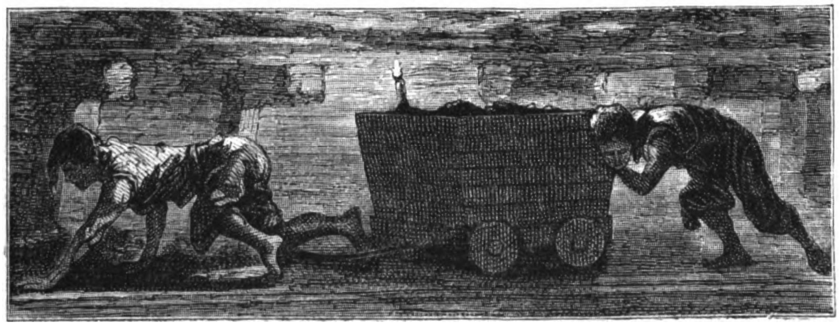
The natural causes which combine to create the vast coal-deposits, necessarily place them far down in the bowels of the earth; and it therefore requires the most untiring energy, lavish expenditure of money, and physical endurance, to bring the coal where it will be practically useful for the wants of man. It is, therefore, to be expected, in the course of years, with the inducements held out to succeed, that mining should become a vast interest, and that the inventions and ways resorted to, to get at the coal, and bring it to the surface of the earth, would be as novel and startling as the object pursued is useful and grand.

At the start, two kinds of underground work are always required by coal-miners: first, the *shaft*, which is the perpendicular opening that descends from the surface of the earth down to the coal-deposit; second, the *levels*, which are the winding streets, if you please, that are opened in the mine by the progress of excavation. The coal-bed having been discovered, and its extent ascertained, if it is decided to "work it," the preliminary steps of opening are commenced.



Walled Level.

When the earth's surface over the coal-bed is composed of lime or sand-stone, the progress is slow and wearisome—sometimes the rocks to be penetrated blunt the tools—in this case the walls of the descending shaft support themselves. When the ground is soft and fragile, the shaft is walled either by brick, stone, or timber, which linings are now in large mines constructed according to the strictest rules of art. Sometimes the shaft goes through a water-bearing strata, and then the difficulties are unusually great, for the walls have to be protected with a lining that will not only keep out the water, but bear the enormous pressure of it from the outside. The cost of making these shafts is often enormous: on a single one in Durham, England, was expended a half million of dollars. M. Simonin makes mention of a shaft over one thousand six hundred feet deep—and which is really a magnificent work of art—which, if it had been built from the surface of the earth upward, would make a tower five times higher than St. Paul's, London, and three times higher than the dome of St. Peter's, at Rome.



Potters or Trolley-boys, in England, formerly.

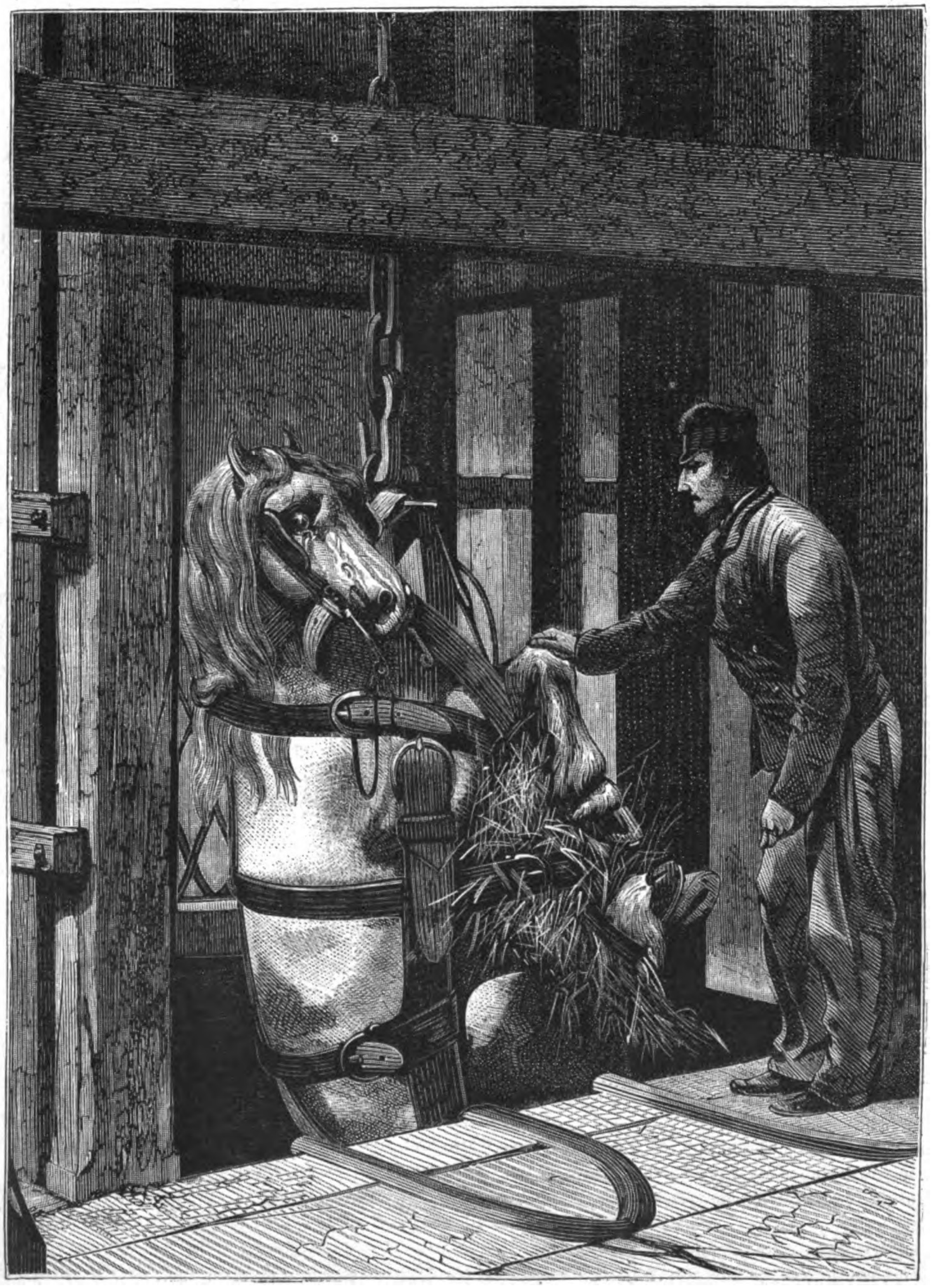
The same obstacles to be overcome in constructing a shaft are to be met with in opening the *levels*, they are sometimes even more difficult in construction, for in them advantage cannot always be taken of circular or elliptical forms, to resist the pressure without; the consequence is, that the levels often crush and crumble, filling themselves with earth, rocks, and, what is more terrible, floods of water. The cost, of the levels is, therefore, but little less expensive than the shafts, and their amount of cost in the aggregate, is much larger, for they often, in one mine, reach the united length of four or five miles. The water-levels, used for draining the mines, frequently grow into huge canals and artificial rivers, some of which are used to transport boat-loads of coal from one locality of the mine to another.

The commencement of the opening of a coal-mine is always interesting. In Catholic countries, in Belgium especially, after the shaft has been opened a few yards, its top is crowned with flowers, and the attendant priest invokes the blessing of Heaven on the enterprise, which, if successful, will give employment to so many people. In course of time, a mine, if it is rich, becomes a large village under ground. It has its streets, its water-courses in the form of canals and rivers, its restaurants, taverns, residences, stables, and workshops. The place is laid off with mathematical care by experienced surveyors. In some collieries there is a person especially appointed, who is charged with those responsible duties; he is called the geometer or surveyor of the mine: he has his instrument-bearer, his chain-carrier, and other necessary assistants. He makes his underground examinations with care, and brings them to completion in the mining-office above-ground.

A visit to a coal-mine is always extremely interesting and exciting to a novice. The underground workings are of course reached by the shaft. In descending, there is an unpleasant sensation of vacancy; the bucket which holds you rubs against the walls; the space is narrow, and appears more so on account of the darkness. The water filters through the surrounding rock, drop by drop, making things damp and unwholesome. Now and then it occurs to you that a stone might fall from the wall, and break your head; that the rope, stretched by the weight it supports, the oscillations of which are perceptible, may also break, or the bottom of the tub may fall out. Then there may be a collision, and possible entanglement with the ascending bucket; but you finally reach your journey's end. Visitors most frequently refuse to descend the shaft in this rude way; some cower down in the bottom of the bucket, where they remain motionless through fear, and it is sometimes actually necessary to turn the bucket over to get these stupefied people out, and they often recover their senses with difficulty. The miners, on the contrary, make this journey twice every day without thought of danger, laughing, and talking, and cracking their jokes as they go down. When the miners arrive at the bottom of the shaft they separate in the gloom, each going to his place of work with all the ease that characterizes people who move about in daylight.

Under the protection of an experienced person you start on your visit, and enter wonderingly the subterranean labyrinth. The lights are dim, but you soon become accustomed to the gloom, and begin to perceive objects. You first notice men begrimed with soot, and get the smell of gunpowder; here the miners are blasting, and getting coal. In the levels the "rolley-boys" are crowded together, and you gradually get the sight of long trains of coal-wagons going and coming, the lamps only for a moment lighting up the faces of the drivers, and showing the forms of the wagons. As you proceed, you find the galleries from which the coal is taken intersecting each other, like the streets of a town; there are cross-roads and squares, each one named, and giving its direction. Some of the galleries, which are long and wide, are well ventilated from the principal thoroughfares and great streets, and constituting, if you please, the aristocratic quarter of the mine; other galleries are low and tortuous, full of bad air, and out of repair. This underground town you find full of inhabitants, who seem to be as contented, and as much at home, as if they were living in sunshine, and working in the green fields. You finally discover that you are walking beside railways used by horses and coal-cars, that you cross large streams by handsome bridges, that you see canals and fountains; and, by more minute observation, you perceive that there are even plants and living creatures peculiar to the mines.

As horses are much used in mines, it is interesting to note how their superior intelligence and fidelity to man develop themselves in these subterranean regions, where they are excluded from the light of day. They are always greatly alarmed at the sight of the mouth of the shaft, which alarm is increased when they are bound with ropes, or forced into a cage used for lowering them into the mine. When thus treated, they are so paralyzed that they make no resistance; being to all appearance overcome with fear, they often seem, in their descent, to be absolutely dead; but when they reach the bottom of the pit they slowly recover their senses and good-nature. Their instinctive ability to look for good footing comes in play in these dark regions of their new home, and they soon become acquainted (even though they cannot read the signs) with the streets and their directions, and learn all the side-passages, corners, and dangerous places. It is truly interesting to see how careful these faithful creatures are not to run against the coal-trains at the "turn-offs," and stopping-places, and how soon they learn the right distance from the air-ways at which they ought to stop, to clear the lungs of foul vapor, and snatch a moment's respite from labor.



Descent of a Horse down a Mine-Shaft.

The horses are well cared for by their owners, and are great favorites with the miners, and in time they become fat and glossy, and seem, on the whole, absolutely to prefer the equable and warm atmosphere of the mine, to great roads varied by wind and rain, sunshine and frost. Rats follow the luxury of oats, and the hiding-places of the hay kept in the mines, and often become great nuisances; they seem to thrive in parts of the mine that would destroy human beings. On one occasion a miner pursued a rat with a lighted candle, and in his excitement passed beyond the line of vitalized air: the consequence was an explosion that killed himself, and wounded many other persons. Bats also find their way into the mines, and are thus more comfortably provided for than where they are annoyed by daylight. It yet remains for the naturalist to illustrate, describe, and classify the animal and vegetable life peculiar to these underground worlds created by man's industry in the acquirement of coal.

A mode of discipline is adopted among the miners, who are sent up and down the shafts in cages or "guides." A certain number go down in the morning and come up at night, to make way for others who compose the "night set" of men. On the following week the "night shift" relieves the day crew of the week before, except in the case of the "packers" and "stowers" away of "gib" or waste. They work only at night and sleep by day, paraphrasing the story of the Belgian miner, who can say—

"My lamp is my sun, and all my days are nights."

Collision of Tubs in a Shaft.

The mouth of a coal-shaft is always animated, as the work is carried on in the open air and by daylight. The tubs filled with coal have, by the aid of powerful steam-machinery erected at the mouth of the mine, rapidly ascended. These tubs are, with surprising promptness, emptied by ingenious ways, some having a movable bottom of the shaft, or turned over by mechanical means. Now, in the bottom of the shaft, the work is performed in reverse order—that is to say, the tubs are loaded and started upward without the loss of a moment. At a given signal, the engine-man, who is on the alert, turns on the steam, the ropes glide on the pulleys, the full tubs coming up, and the empty ones going down. The engine-man is governed by an index, which informs him when the tubs will pass each other in the shaft, and he avoids the possibility of even casual collision by moderating his speed when the ascending and descending tubs meet. This point passed, every thing moves rapidly again. It is thus, by good management and promptitude, coupled with rapidity and the power of the enormous engines, that, in many instances, such immense quantities of coal are drawn from a single pit—from six to eight hundred tons per day in France and Belgium, and a thousand tons per day in England.

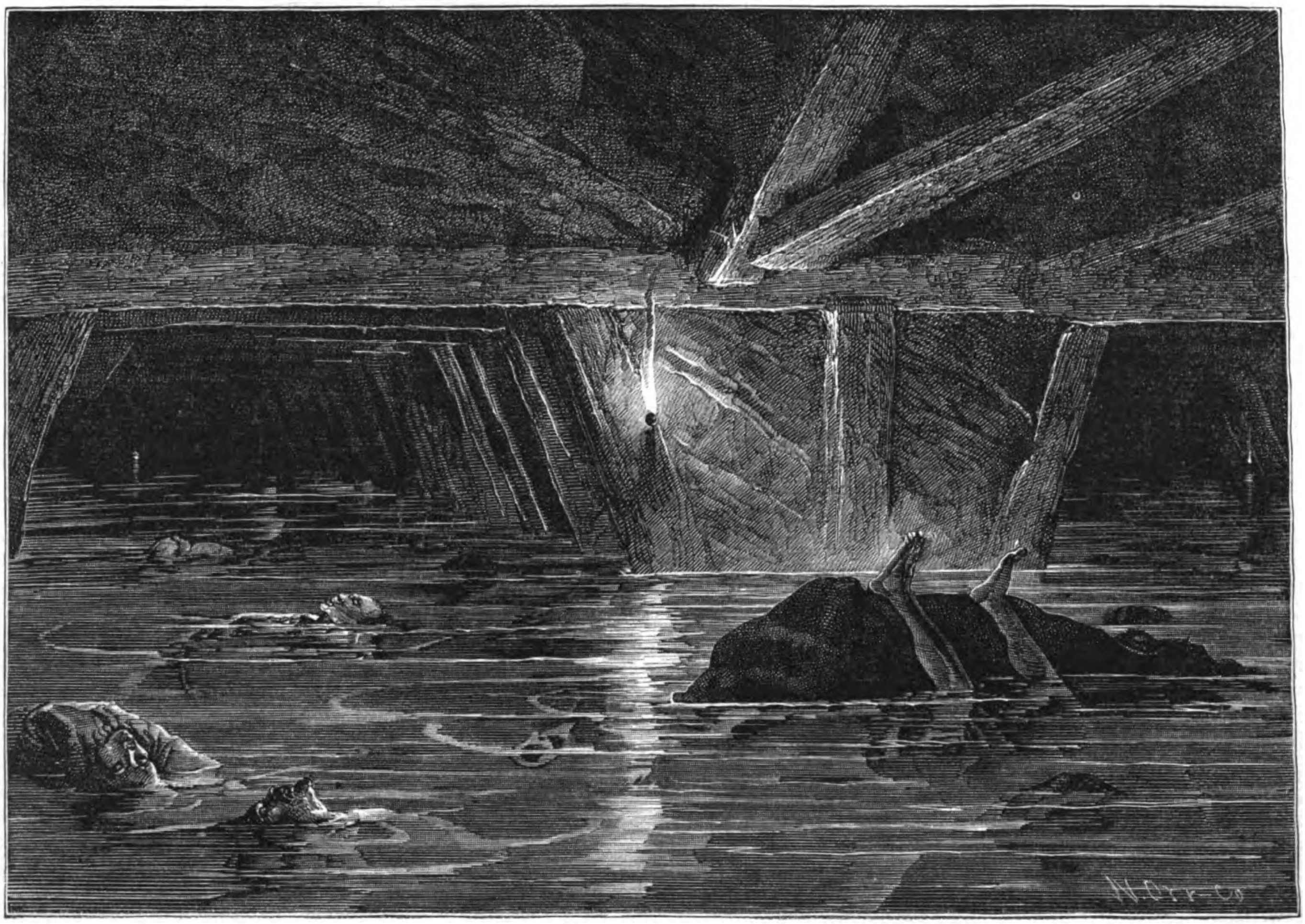
We have only now been informed of the beginning of the struggle. It has been hinted at how great the expenditure of capital and labor a mine involves; it must now be our painful duty to allude to the cost of human life, and show how much sacrifice is sometimes required to produce a piece of coal for every-day use. It is not without reason that the art of mining borrows some of its terms from the art of war; that in France a year's work is called a campaign, the underground working-places posts, a gang of miners a brigade or squadron—in England a crew or shift—while in Cornwall the underground manager is called a captain, and the store-keeper a purser. Is it not said that they attack the coal, and is not the mine itself the colliers' field of battle? Is it not there that, in his struggles against all dangers, he may be said to combat them foot to foot? The four elements of the ancients—earth, air, fire, and water—all conspire against him.

Fire menaces him in blasting, in the firing of the coal, and in explosions of fire-damp; the air, by becoming rarefied, or mixed with mephitic or explosive vapors; the earth, in falls of roofs, etc.; the water, by inundations. The collier opposes to all these (often invisible) enemies, the calm stoicism, the approved courage, and the practical science which tend to make the brave and skilled miner. And the underground soldier is the more meritorious, in that he is encouraged neither by the certainty of advancement, nor by the hope of honorable recompense, in this contest in which he risks his life at every moment. He has only the satisfaction of observing discipline, and of faithfully doing his duty.

Fire is perhaps the most terrible enemy the collier has to encounter, and it is in the firing of shots in blasting that he is to guard most carefully against its attacks.

A stall, when blasting is being carried on, always offers a splendid sight. In order to lose as little time as possible, all the shots are fired together. At a signal given by the leading man, a light is applied to the match, and all retire as fast as they can. The shots go off at close intervals: the air is driven afar; the masses give way, and are shattered; fragments of rock are blown here and there, and the noise of the explosion is reëchoed throughout the mine. It is a regular cannonade. A thick white smoke, with a nauseous smell, deleterious gases resulting from the combustion of sulphur, charcoal, and saltpetre, fill the level, and are slowly dissipated. Then the men soon return to their work, and sound the rock with a hammer, in order to judge of the effects produced by the explosion.

When a shot does not go off, it is only after the utmost precautions have been taken, and a proper delay, that the miner ought to approach. There are instances of shots having gone off ten minutes after being lighted. Numerous and dreadful accidents have arisen in consequence of too great a haste on the part of the miner in his anx-



Inundation of a Mine.

iety to return to his post, to untamp the hole. In many districts this is not allowed; then new holes have to be made.

Accidents from blasting arise, also, from other causes: instead of using cartridges, the powder is merely poured into the bottom of the hole, under the pretext that it will act more powerfully. It is scattered over the sides, and, in working the tamping-bar or the needle, a spark may be produced by the friction of the iron against silicious substances, precisely as in the impact of steel. The spark is then communicated to the powder, and the charge explodes in the face of the miner, who is blinded or disfigured, if not killed on the spot.

It is always at the bottom of the shafts that the firing of powder is attended with danger. The men can only escape to the surface after the charge is lighted, and it is necessary that they should be raised with all speed—at any rate, to a certain height. The horses working in the mines understand the signal that precedes an explosion, as, at the first sound of the bell, the intelligent animals start off at full speed.

Men mutually engaged in dangerous work become greatly attached to each other, and instances of heroic devotion are frequently occurring among the miners.

"In a certain Cornish mine (South Caradon) two miners, deep down in the shaft, were engaged in putting in a shot for blasting: they had completed their affair, and were about to give the signal for being hoisted up; one at a time was all their coadjutor at the top could manage, and the second was to kindle the match, and then mount with all speed. Now, it chanced, while they were both still below, one of them thought the match too long; tried to break it shorter; took a couple of stones, a flat and a sharp, to cut it shorter; did cut it of the due length, but, horrible to relate, kindled it at the same time, and both were still below! Both shouted vehemently to the coadjutor at the windlass, both sprang at the basket; the windlass-man could not move it with them both. Here was a moment for poor miner Verran and miner Roberts! Instant horrible death hangs over both, when Verran generously resigns himself: 'Go aloft, Roberts,' and sits down; 'away, in one minute I shall be in heaven!' Roberts bounds aloft, the explosion instantly follows, bruises his face as he looks over; he is safe above-ground: and poor Verran? Descending eagerly, they find Michael Verran too, as if by miracle, buried under rocks which had arched themselves over them, and little injured; he too is brought up safe, and all ends joyfully."

L. Simonin quotes the above incident from Carlyle's Life of John Sterling, and the additional fact that Verran was anxious after this to work above-ground, and also to gain a little schooling; a few hearty admirers of his heroic act were glad to subscribe a little sum to enable him to spend some months at school. Here he acquired the great arts of reading and writing, then established himself in a farm and married a schoolmistress, with whom he and his affairs prospered as they deserved.

One of the most melancholy catastrophes that can overwhelm the miner is the falling in of the roofs and wallings that support the various levels of the mine, and woe to the unfortunate who is involved in the catastrophe! The interruptions of water from old workings are perhaps to be most apprehended.

One of the most fatal cases of inundation took place at Heaton Colliery, near Newcastle, on the 3d of May, 1815, owing to a failure in exploring through a fault, where the ordinary thickness of coal between the workings of the colliery and the inundated wastes of the adjoining Old Heaton had been reduced till it gave way under the extreme pressure. A dreadful inundation was the consequence, which immersed ninety human beings in the upper part of the workings, from which there was no possibility of relief. Some miraculous escapes were made by some of the persons who happened to be close to the shaft, but the place where the water burst in being many hundred yards distant, and forming a descending plane of one in ten, the tremendous force of the current bore down every obstacle, and hurled, in the most awful confusion, men, horses, carriages, and all that stood in its way toward the shaft, where some fortunate beings escaped when the water was nearly breast high. Many months elapsed before the waters were sufficiently drained to render the workings again accessible. On the 19th of February, in the following year, fifty-four bodies were brought to the surface, and were all recognized, with one exception, principally by their clothes. Twenty-nine were buried at Wallsend, and the mournful procession filled the road for a mile in length.

The bodies of these poor people were without smell, but so perfect and clay-like that, upon pressing the flesh, the indentation remained. No opinion can be formed whether they had suffered much bodily pain; but their mental agonies must have been of the most maddening description, since no earthly hope could be entertained that it was in the power of their fellow-men to afford them any succor.

Subterranean fires only trouble the miners by the mephitic vapors which they give out, and the high temperature they create in the stalls. But it is otherwise with fires caused by the explosive gas of coal-mines—that combination of hydrogen and carbon, that brother of illuminating gas.

No meteor, however terrible its imagined splendor, can be compared to an explosion of fire-damp. Let one of those scourges of Heaven be imagined, which appear sometimes as if designed for the punishment of human beings—a thunderbolt, a hurricane, a cyclone, or a whirlwind—burning, overthrowing, destroying every thing in their course, and the effects produced by them will still be inferior to those caused by an explosion of mine-gas. A discharge of cannon loaded with canister-shot, and fired point-blank into a crowd; a powder-magazine taking fire in the midst of a body of workmen; a gasometer exploding in a factory—can scarcely give an idea of an explosion of fire-damp suddenly overtaking the miner.

The moment the mixed gas comes in contact with the flame of a lamp, a tremendous explosion takes place, resulting from the combination of the components of the fire-damp, hydrogen and carbon, with the oxygen of the air. The two former separate to combine with the oxygen, with which they have the greatest affinity. The double phenomenon only takes place at a high temperature; without flame it would not arise. The reaction produces an effect like the most brilliant lightning, and makes itself heard by a clap of thunder. The explosion spreads instantly into all the galleries of the mine; a roaring whirlwind of flaming air destroys every thing it encounters, overthrowing trams, barricades, and trap-doors, mounts into the shaft, and lifts from their foundations the staging which covers its mouth, through which it discharges thick clouds of coal, stone, and timber.

The men are blinded, thrown down, scorched, and sometimes burnt to a cinder; often their clothes take fire, and not unfrequently they are buried beneath the ruins of the fallen roofs. When an attempt is made to fly to their assistance, there is not time to rescue them; there are only corpses left which are scarcely recognizable. The calamity spares nobody, even though as many as one or two hundred miners may be at work; death extends over the whole of the mine where the explosive gas was present.

The air-doors are thrown down, the ventilation of the mine is reversed, the underground atmosphere is vitiated by the combustion of the fire-damp, and the stalls are filled with steam and carbonic acid. Sometimes the temperature rises so much that the coal is converted into coke at the sides of the galleries, and the commotion is so great that the dams have to withstand both fire and water, and the wallings, raised for the purpose of resisting the thrust of the measures, are themselves overthrown. Then to a scene of already indescribable desolation are added the horrors of inundation, falls of the ground, and fire, where the explosion has already made only too many victims.

To take at random an example of these heart-rending accidents, we will notice that of the mine of Méons, near Saint-Étienne. The over-man and three other men went down into the mine, where they found the stable-men looking after the horses, and the carpenters at their work. Suddenly a frightful report was heard. The masonry surrounding the mouth of the shaft, made of large, dressed stones, the framework supporting the pulleys, were all blown to a distance of even more than a hundred yards from the opening. The very tubs and the ropes were lifted from the bottom of the mine by the devastating hurricane, and hurled into space. The superintendent arrived, filled with alarm. He thought a boiler had burst, but it was an explosion of fire-damp. An attempt at rescue was promptly organized, but the lamps were extinguished, and, the galleries of the mine being filled with smoke and bad air, the rescuers fell suffocated, and two of them were dead.

Falling in of a Mine.

Explosion in a Coal-Mine.

An ambulance was established at the entrance to the mine, and another descent made. The colliers, when a comrade has to be rescued from danger, will sacrifice themselves to the last man. The search was carried on throughout the night, by feeling, for the lamps would not burn. At ten o'clock the next morning none of the victims had been recovered, and a number of asphyxiated searchers filled the ambulance.

An agitated crowd, consisting of the families of the miners, pressed round the pit-mouth. One woman in particular attracted attention, on account of the deep sorrow she displayed; she was young and beautiful; she carried a babe at her bosom, and large tears fell from her eyes. She is the wife of the over-man. She requested, as a special favor, to be allowed to enter the mine in order to recover her husband; but no woman being permitted to go into the workings, she anxiously waited outside.

Now they returned into the interior. The wrecks of the timberings and the coal which had been blown down formed a desolating sight. From time to time blocks of coal were still heard to fall, as they became detached from the walls. The carpenters, who were repairing the timbering, had been crushed. All the horses (of which there were six) were found suffocated in the stable, and the groom dead with them, lying in the manger, apparently asleep; the hay had been set on fire and was still burning. At length one of the men, who went down with the over-man, was discovered, and alive! Blown by the explosion to the bottom of a gallery, he had been horribly scorched and nearly blinded. His escape was cut off by falls of coal and rock, and, as he had no light, he durst not move. Hearing no noise for fifteen hours, and despairing of ever beholding the light of day again, he awaited death with resignation, consoling himself with the thought (to make use of his own words) "that his wife and children would be supported by the benefit-club of the mine." After this first rescue, another man was found, almost burned in the rubbish, but still alive. He said he had seen a *river of fire* pass over him, and, to save himself, he placed his hand over his eyes. They were frightfully injured, and he was blind.

This memorable catastrophe long inspired the miners of the country where it occurred with a sort of superstitious terror. They no longer went to work without their safety-lamps, and without first imploring divine protection, and commending themselves to Saint Barbe, the miners' patron saint, whose statue was solemnly erected at the mouth of the gallery.

Modern mechanical inventions of great size and power, known as air-pumps, worked by steam-engines of the largest size, are used to ventilate the mines. Not only is pure air supplied by these immense machines, but all the irrespirable gases are got rid of which accumulate in them, and which form distinct layers in the galleries. The carbonic acid, being the heaviest, is at the bottom; if a dog were carried into it, the animal would fall dead from suffocation. The lamp of the miner would also be extinguished by coming in contact with it. Then comes the middle layer, which is composed more or less of pure air, and, lastly, occupying the higher levels, is the light carburetted hydrogen, the inflammable gas which, when mixed with air, forms the terrible fire-damp, the effects of which we have attempted to describe. Sometimes all these gases are intermingled; it is then that explosions and suffocations are especially to be apprehended. Good ventilation, either by natural or artificial means, and the use of safety-lamps, are the only means by which accidents from explosions of fire-damp can be avoided.

On entering a mine where the air is bad, the lights gradually grow pale, and are finally extinguished. A sort of pressure on the temples is felt, a faintness, a sense of extreme lassitude and fatigue in the limbs, the action of the heart fails, and suffocation approaches. The lights now either cease to burn in the foul air, or become, on the slightest motion, extinguished; a better place must be obtained without delay, and instant retreat becomes necessary. With what delight a fresher and purer air is breathed! that which was just left being, in the language of the miners, *dead*. The successful lighting of a match is now hailed with joy, and, less inquisitive than Lot's wife, the delighted miners flee from threatening danger, without looking once behind.